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THOUGHTS, &c.

BRITISH MUSEUM

THOUGHTS

ON THE EFFECTS OF THE

APPLICATION AND ABSTRACTION

OF

STIMULI

ON THE

HUMAN BODY;

WITH A PARTICULAR VIEW TO EXPLAIN

THE NATURE AND CURE

OF

TYPHUS.

By JAMES WOOD, M. D.

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At noſtri bene computentur anni,
Et, quantum tetricæ tulere febres,
Aut languor gravis, aut mali dolores,
A vita meliore ſeparentur:
Infantes ſumus, et ſenes videmur.
. . . . . .
Non eſt vivere, ſed valere, vita.
Mart. Lib. vi. Ep. lxx.

O Temperance! thou goddeſs moſt worthy to be adored! thou patroneſs of health! thou protector of beauty! thou prolonger of life! thou inſurer of pleaſure! thou promoter of buſineſs! thou guardian of the perſon! thou preſerver of the underſtanding! thou parent of every intellectual improvement, and of every moral virtue!
DEFORMITY, *an Eſſay, by W. Hay, Eſq.*

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1793.

BRITISH MUSEUM

ADVERTISEMENT.

THE following "Thoughts" were first read, in the month of September, 1792, in a more condenſed form, before the Philoſophical and Medical Society of Newcaſtle; ſince which period, by the ſucceſs of the practice, founded on the theory propoſed, and by the favourable opinion of it expreſſed by many of the Author's friends, he is induced to offer the whole to the public attention.

TO

JAMES WOOD, Esq.

SURGEON, IN BERWICK UPON TWEED.

SIR,

TO the pleasure, which, as a Son, I now add that, which, as a Professional Man, I feel, in paying a tribute of respect to whom it is due; and this is, from every one, your claim, as an experienced, and successful practitioner in Medicine, but particularly from me, on this occasion, as you, for more than thirty years, have pursued, with much success, the practice, the theory of which I now endeavour to explain.

This, Sir, I consider no small sanction to the Work, which I now PRESENT you; and the approbation you have expressed of it, with the opportunity, now given me, of declaring the satisfaction I derive from your approbation, are sources of happiness to me, which neither time, nor circumstance, can diminish, or disturb.

I am, Sir,

Your affectionate Son,

JAMES WOOD.

Newcastle upon Tyne,
February 11, 1793.

PREFACE.

IN this illumined æra, when the miſts of darkneſs, which hung over almoſt every ſcience, are faſt diſperſing by the clear light of diſcovery, Medicine has to boaſt of its attainment of a large ſhare of thoſe valuable rays, the bright emanations of the genius of a MONRO, a HUNTER, a CULLEN, a GREGORY, a WINTRINGHAM, a VERSAUR, a LETTSOM, a HIGGINS, a BLACK, a HEWSON, a PRIESTLEY, a CRAWFORD, a LAVOISIER, and of others, and conſequently, of the diminution of the number, in the dire liſt of thoſe diſeaſes, which its profeſſors were obliged to diſtinguiſh by the epithet *incurable*. A few of that dreadful catalogue ſtill remain, and *Typhus* has no claim to be yet excluded from the number; ſurely therefore, the efforts of any one to illuſtrate the nature of a diſeaſe, ſo common, and ſo frequently fatal, muſt be every way deſirable; and may

we not hope, that, from repeated attempts, its theory may be gradually enlightened, and one of the crowded avenues to the grave may be cloſed? And may we not alſo ſafely predict, judging from the rapid progreſs acquired in the knowledge of philoſophy, and medicine, within a very few late years, that, by ſimilar attempts, every diſeaſe, whoſe nature is any way obſcure, may be at laſt clearly explained, and the profeſſors of medicine may find themſelves in poſſeſſion of the *Ne plus ultra*, of the temple of truth itſelf?

To obtain this happy reſult of the efforts of united genius, an object which almoſt dazzles the perſpective eye, we muſt more cloſely purſue the path of ſimple nature, and be convinced, the nearer we are to her, the ſooner we will approach the end; already has all our additional knowledge proved this fact; and, ſtrange to reflect, it appears to be the chief labour of the preſent

ſent age, to recal from deviating ways the whole ideas, I may almoſt ſay, of the ancient profeſſors. I need adduce only one inſtance in proof of this; the ſingular mortality among the young of the human race, which has been frequently calculated at no leſs an average, than that *one half* of them die before two years of age; more late calculators have ſuppoſed the average to be only *one third*, which is ſtill a dreadful truth, and can only be explained, as the effects of intemperance, and of deviations from the Hygæian path of nature.

I will on this occaſion, as well as on any other, when I may venture to give my ideas to the world, moſt carefully avoid the *rage* of theory, and will never allow myſelf, through the violence of defending my opinions, to collect only what is favorable, and reject whatever is inimical to thoſe I have formed; which has been too often the cauſe of illuſion, and retardation

in the progreſs of phyſic; but I will coolly ſtate unexaggerated facts, and deliberate obſervations. On this ſubject, I cannot reſiſt adding, how cautiouſly we ſhould permit *novelty* alone to influence the mind, either in theory, or in practice, examples of which, are too numerous, and notorious not to be known, and many too ridiculous to be acknowledged!

Equally ſenſible of theſe frailties of our nature, and of the importance of the extenſive, and difficult ſubject, which I have at preſent undertaken, I am filled with apprehenſion at the idea of my not being able to purſue it, with ſatisfaction to myſelf, or to the world. I therefore would wiſh this attempt to be conſidered only as the *outlines* of a theory, which, if it be founded on any truth, may receive the digeſtion of time, and the correction of farther experience, and may hereafter be rendered a more perfect ſtructure.

If,

If, however, there ſhould be found in theſe thoughts, any, beneficial to medicine, or explanatory of any obſcure part of phyſiology, I can only claim the merit of application, and obſervation, as I do not pretend to apply the reſult of any experiments of my own, but of thoſe of others.

Notwithſtanding neither the theory, nor the practice, of the late Dr John Brown, can be received by any rational phyſician, and this his moſt enthuſiaſtic admirers now acknowledge, yet a part of the former, has tended to explain, in the moſt ſimple and ſatisfactory manner, many parts of phyſiology, before involved in much obſcurity, and is now received, and eſtabliſhed, in the moſt reſpectable ſchools of medicine. I will not point out, how far the theory, which I now offer, differs with that of Dr Brown, and how far it reſts on the ſame foundation, as it will immediately appear to thoſe, who are acquainted with Dr Brown's

Brown's theory; I will only remark, though, however miſtaken and dangerous he may have been in his practice, or however his general theory was buried in errors and ſuperfluities, yet the doctrine of irritability, to which his theory gave being, will ever remain, at once, an enviable monument to his memory, and an invaluable acquiſition to phyſiological knowledge.

Dr Cullen's Theory of Excitement and Collapſe agrees with a part of Dr Brown's theory; but Dr Cullen has never hinted at ſuch a ſtate of the muſcular fibre, as that of *accumulated* irritability; to explain this ſtate, he is obliged to uſe the term *ſedative*, which he indiſcriminately applies to the effects of opium and of cold.

Every application of chemical knowledge, which I have made on this occaſion, is the reſult of the experiments of Lavoiſier; and, as I imagine his theory and nomenclature, are now generally acknowledged to be

founded

founded on the trueſt principles, I will apply them both to my ſubject, and in doing ſo, I will always conſider them as received and eſtabliſhed axioms.

It may not perhaps be deemed ſuperfluous to relate the origin of the following thoughts. Having, in repeated inſtances, exhibited the *bark* in *Typhus* unſucceſsfully, and it having been taken, in many of thoſe inſtances, in the moſt advantageous manner, I naturally began to doubt of the efficacy of this medicine in *Typhus*, and to feel the impoſſibility of my ever again relying on its powers alone. I therefore took into conſideration the circumſtances attending thoſe who recovered, and the whole of the ſymptoms of the incipient and advanced ſtage of the fever; and I perceived, that thoſe, who recovered, enjoyed, in a great degree, the means of preventing, and correcting the tendency to a putreſcent ſtate; and that thoſe, who died, exhibited

bited that ſtate, in a great degree, and during the courſe of the fever, diſcovered a particular anxiety, and oppreſſion, in the act of reſpiration, and daily exhibited new ſymptoms of exhauſted energy and ſtrength.

At this time, a coincidence of ideas forced themſelves on my mind. I recollected the ſymptoms of accumulated *carbone* in *Typhus*; I recollected that *carbone* was continually accumulating in the ſyſtem, in a ſtate of health, and was carried off, in the form of *carbonic acid*, by its combination with *oxygen* in the lungs; and it occurred to me, that the oppreſſion, and anxiety in reſpiration, common in *Typhus*, might proceed from the deficiency of *oxygen*, to carry off the accumulated *carbone;* I therefore concluded, that if *oxygen* could be exhibited, by any means, into the ſyſtem in ſufficient quantity, to combine with the ſuperfluous morbid *carbone*, that the tendency to putrefaction would be checked, and the fever diminiſhed.

During

During theſe conſiderations, a medicine was brought to my remembrance, which had been uſed, with the greateſt ſucceſs, in this fever, to a very great number of patients*. I recollected, that this medicine, which was Nitre, contained *oxygen*, in a great quantity;—and alſo, as *oxygen* forms the baſis of all acidity, that many other acids, as well as the *Nitric*, might have a ſimilar effect.

Every obſervation, that I had made, having alſo induced me to conſider an *exhauſted* ſtate of the irritability of the muſcular fibre, and of the excitability of the *ſolidum vivum*, to be the common cauſe of death in *Typhus;* and as different cauſes of death have been aſſigned, by many authors; I will endeavour to ſhew the probability of the cauſe, I have mentioned, without conſidering that of any other cauſe,

* By the Author's Father.

which has been aſſigned. I muſt alſo here declare my intention, of neither diſcuſſing any other theory, on this ſubject, nor any other theory, in phyſiology, but merely advance my own; and, as I do not mean to make quotations from any author, on account of the labyrinth, to which ſuch quotations might often lead; I hope I ſhall be excuſed, if I ever adopt a part of any theory, or opinion, beſides thoſe which I have generally acknowledged, without reference to the author.

As I wiſh to give a ſimple, conciſe, and perſpicuous view of the theory I entertain, I will avoid every amplification, which might reſult from any part of it; and alſo, to anſwer this intention more fully, I have formed two Scales, by which it may be exhibited, at one condenſed view.

It is, therefore, in order to give ſome foundation for theſe ſeveral opinions, and to endeavour to make them probable, that I have

I have *thrown together* the arguments of this work; of theſe, I am conſcious of not being able, on a firſt attempt, to form a ſolid whole; but I will always take care, that the baſis of each ſhall not be entirely hypothetical; and I will wait for the verdict of time, on the truth of the concluſions, drawn from the combination, and reſult of all.

Before I cloſe this preface, let me declare myſelf a candidate, for the favour and indulgence of thoſe, through whoſe ordeal this eſſay may paſs—its author eaſily imagines, that in a *firſt eſſay*, he may be liable to the ſeverity of criticiſm; but let every imperfection be balanced, by the unobjectionable ſafety of his doctrines, and by the ſincere deſire of being of uſe to mankind.

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IN the human living body, there are diſtinctly perceived, three different kinds of ſolid matter; one, which poſſeſſes only the properties of all inanimate matter, called the *ſimple ſolids*; another, which is diſtinguiſhed by the power of contraction, called the *living ſolids*, or the *muſcular fibre*; and the third, which does not poſſeſs the power of contraction, but that of receiving impreſſions, and of ſenſation, called the *medullary fibres*, or the *nervous ſyſtem*.

On

On the firſt, or ſimple ſolids, it will not be neceſſary here to enlarge, nor on the properties, which the muſcular, and medullary ſolids, poſſeſs, in common, with the inanimate ſimple ſolid; but only, on the particular characteriſtics of each; the power of contraction of the one, and of ſenſation of the other.

It has been ſuppoſed, by many phyſiologiſts, that the matter of the muſcular, was the ſame as that of the medullary fibre; and that the former, was a continuation of the latter, differently organized. It is equally applicable to the theory I entertain, whether the one is, or is not, a continuation of the other; yet, as the muſcular fibre poſſeſſes a power of contraction, which the medullary does not poſſeſs, I will conſider them as diſtinct matter; but it is not neceſſary here, that I ſhould take a view of the influence, or connection of the one, on, or with the other; or take any metaphyſical

cal view of the medullary matter; I am only to conſider the property, which each poſſeſſes, of being acted upon by ſtimulant powers; and the property of ſenſation in the medullary fibre, when acted upon by any ſtimulus, I have named, in the ſcale I have drawn, *excitability;* and the property of contraction in the muſcular fibre, when any ſtimulus is applied, I have named *irritability;* and as I ſhall always conſider theſe two ſeparate powers to be coeval, and exiſting in an equal ratio in each, I will confine myſelf to the conſideration of the irritability of the muſcular fibre, it being always underſtood, that whatever applies to this, the ſame is exactly applicable to the excitability of the medullary matter; I only wiſh to preſerve both theſe terms, for the ſake of clearneſs, and perſpicuity, and to avoid all controverſy on the ſubject.

The greater or leſſer ſtimulus, required to excite the ſame degree of contraction, in a muſcular

muſcular fibre, will prove the exiſtence of leſs, or more, of irritability, in that fibre; when ſo much irritability exiſts, as to be capable of being acted upon by the weakeſt ſtimulus, this I will term *a ſtate of* ACCUMULATED *irritability;* and when, on the contrary, no contraction can be produced, but by the application of a powerful ſtimulus, this I will term *a ſtate of* EXHAUSTED *irritability.*

As life only exiſts, by the continued application of ſtimulant powers to the body, I will next take notice of ſome of theſe ſtimulant powers, conſider their comparative nature in general, and afterwards, their firſt, and ultimate effects on the human body.

As it is now eſtabliſhed in chemiſtry, that there is not ſuch a ſtate as *cold;* every degree of cold, even the moſt extreme degree, with which we are acquainted, being only a diminution of heat; ſo, in phyſiology,

gy, it may be received as an axiom, that there is nothing in nature poſſeſſed of a *ſedative* * power, but that all matter is STIMULANT; and that, which is called *ſedative*, is only a diminution of the STIMULANT power †.

The firſt great, and moſt general, ſtimulus in nature, is the atmoſpheric air; and, by the moſt accurate experiments of Lavoiſier, he has proved, that the ſtratum of air, which we inhabit, is compoſed of two different aeriform fluids, one of which he calls *azotic gas*, the other *oxygen gas*; and that theſe two *gaſſes* exiſt in the proportion of 73 of *azotic gas* to 27 of *oxygen gas*. He has alſo ſhewn, that the baſe of *azotic gas*, or *azote*, which name he has given to

* This *term* is here uſed, with the idea commonly annexed to it; as the *oppoſite* to STIMULANT.

† The effect, called *ſedative*, has been applied, by ſome phyſicians, to the operation of different articles of the Materia Medica, which are highly ſtimulant, to opium, camphor, &c. and with ſome propriety; as the more the irritability is *exhauſted*, the more *ſedative* will be the ſtate of the muſcular fibre.

that air, called by Dr Black *bad air*, and by others *mephitic air*, forms, with *caloric*, *azotic gas*, and that it cannot be breathed by animals, but is deſtructive to animal life; neither will it admit of the combuſtion of inflammable bodies, nor of the calcination of metals: And that the baſe of *oxygen gas*, or *oxygen*, by which name he diſtinguiſhes that air called vital, or dephlogiſticated, in its union with *caloric*, forms *oxygen gas*, which is highly capable of reſpiration, and of contributing to animal life, in which metals are calcinable, and combuſtible bodies will burn.

However various and oppoſite have been the opinions of philoſophers and phyſiologiſts, of the object of the ſingular function of reſpiration, yet all agree that it is eſſential to life, and that it cannot be ſuſpended for any time, without expoſing the animal to the danger of immediate death. It is alſo univerſally agreed, that air, or an elaſtic

tic fluid, is received into the lungs in inſpiration; and it is alſo very well known, that there are many kinds of air, or elaſtic fluids, which animals cannot breathe, without periſhing, as ſoon as if they had no air to reſpire.

I might here enumerate the opinions and theories of many eminent men, particularly of Crawford, Hewſon, M. Cigna of Turin, and more particularly of Dr Prieſtley, and obſerve, how gradually they have approached to truth; but ſuch would be altogether ſuperfluous: I will therefore only relate that, which is founded on the late diſcoveries of Lavoiſier, the accuracy and beauty of whoſe experiments carry with them irreſiſtible conviction. He has ſhewn, that only that part of our atmoſphere, which he calls *oxygen gas*, is capable of contributing to animal life; that this is received into the lungs of animals in inſpiration; and that fixed air, or *carbonic acid*,

is thrown out in exſpiration; and that *azotic gas*, the other part, which forms our atmoſphere, enters the lungs with the *oxygen gas*, and departs from them, without change or alteration. He has alſo ſhewn that *oxygen* with *carbone*, or the baſe of charcoal, forms *carbonic acid*; and as this acid, in the ſtate of air, is thrown out of the lungs in exſpiration, he concludes, that the baſe of the *oxygen gas* meets with *carbone* in the lungs, and forms the *carbonic acid*. And as he has alſo ſhewn, that *oxygen* with *hydrogen*, forms water; and as there is water thrown out of the lungs, in form of vapour, it is a reaſonable concluſion, that a part of the *oxygen* received into the lungs, unites with *hydrogen* there, and forms the water which is exhaled. And Lavoiſier has alſo calculated that it requires 85 parts of *oxygen* to 15 of *hydrogen*, to form water; and 72 parts of *oxygen* with 28 of *carbone*, to form *carbonic acid*.

From

From the whole, this concluſion may be drawn, that it is the *oxygen* of the atmoſpheric air, which is neceſſary to life; that " in this immenſe magazine of *oxygen gas*, all animals live and grow," and that the general abſtraction of it, for a few minutes, would render all animal nature a lifeleſs maſs. The chemical powers of *oxygen*, therefore, are obvious; and its ſtimulant powers will eaſily be admitted, when we conſider, that without it, the action of the heart inſtantly ceaſes; yet, at the ſame time, it appears to be the mildeſt ſtimulus, with which we are acquainted, as its action is never followed by any exhauſtion of the irritability of the muſcular fibre; but it rather ſeems to be *the power which reſtores the irritability*, whether accumulated or exhauſted, to that ſtate, known by the ſtate of health and waking.

Water is the next general ſtimulus to air; and there is reaſon to believe, that its

its ſtimulant effects on the body exactly correſpond with thoſe of the atmoſpheric air; with this difference perhaps, that the *hydrogen*, combined with the *oxygen*, may prove a ſtronger ſtimulus, and tend to produce, in a ſmall degree, an exhauſted ſtate of irritability.

Vegetables ſeem the next ſtimulants in gradation; they are compoſed of *oxygen*, *hydrogen*, and *charcoal*, in different proportions, and ſome alſo of *azote*, and exhauſt irritability more than air or water. Animal matter is ſtill a higher ſtimulant; containing, beſides the conſtituent elements of vegetable matter, always *azote; hydrogen* in greater quantity, and *phoſphorus*, and *ſulphur*. Vinous, and ſpirituous liquors, are ſtill more powerful ſtimulants; and alſo different ſubſtances of the Materia Medica, ſuch as opium, camphor, cantharides, &c. of theſe different ſtimuli, I will only here generally remark, that in exact proportion

to

to their ſtimulant powers, they will, when applied to the body, in any given ſtate, produce more or leſs an exhauſtion of irritability; more particular marks of which will be evident in the conſideration of the Scales I have made.

There are other ſtimulant powers, beſides thoſe, which are received into the lungs and ſtomach; I mean, certain impreſſions made on the external ſenſes, and certain ſenſations of the mind. Of the former, light, and ſounds, are the moſt general; light acts as an univerſal ſtimulus; its preſence enlivens all nature, and with its departure, the animal, as well as the vegetable kingdom, *naturally* ſink into the ſtate of ſleep. Different ſounds act alſo as powerful ſtimulants: the trumpet and the drum afford the ſoldier inſtances of this; and the melody of different muſical inſtruments tells the truth ſtrongly to the muſical ear.

Different objects preſented to the eye, or

to

to the mind, prove likewiſe powerful ſtimulants to the body; and theſe are all ſuch as make an agreeable impreſſion on the ſenſes; ſuch as hope, joy, &c. and alſo there are a few, though not of the agreeable kind, which, by exciting ſenſations of anger, or reſentment, prove alſo powerfully ſtimulant to the ſyſtem.

It may be proper here to remark, that although all matter in itſelf is aſſerted to be more or leſs poſſeſſed of a ſtimulant power*, yet ſome of the ſenſations of the mind ſeem to have an effect on the body, the reverſe of that produced by ſtimulant powers; ſuch as the ſenſations of ſhame, fear in a certain degree, grief, &c. and directly produce a ſtate of accumulated irritability.

* Some articles of the Materia Medica, may alſo ultimately prove an exception to this; ſuch as many of the neutral ſalts, which, though their firſt action is locally ſtimulant to the inteſtines, produce, by evacuation, that ſtate of the muſcular fibre, the reverſe of that which ſtimulant matter produces, an accumulation of irritability.

Having

Having taken a general view of different ſtimulant powers, to whoſe operation the human body is conſtantly ſubject, and of thoſe, to which it is occaſionally expoſed; I will next endeavour to divide theſe ſtimulant powers into five claſſes, or genera:

1. Thoſe ſtimulants, which have a *chemical* effect on the ſyſtem, and which, at the ſame time, neither afford nutriment to the body, nor much exhauſt irritability; ſuch as the atmoſpheric air, water, ſome of the vegetable acids, and *oxygen* in its various combinations.

2. Thoſe, which have a *chemical* effect on the ſyſtem, which, at the ſame time, afford ſome nutriment to the body, and which alſo exhauſt irritability, or are highly ſtimulant; ſuch as different vegetable matter, after having undergone the vinous fermentation.

3. Thoſe, which have not any evident

chemical effect on the ſyſtem, nor yet afford much nutriment to the body, but which quickly exhauſt irritability, or are highly ſtimulant; ſuch as ſpirit of wine, in its different degrees of ſtrength; ſome articles of the Materia Medica, ſuch as vitriolic æther, and opium, in large doſes; and violent paſſions of the mind, violent exerciſe, &c.

4. Thoſe, which have not any evident *chemical* effect on the ſyſtem, which do not quickly nor violently exhauſt irritability, and yet afford a great degree of nutriment to the body, and ſtimulus to the mind; ſuch as different kinds of mucilaginous, farinaceous, and animal matter; agreeable and moderate paſſions, opium in ſmall quantities, camphor, &c.

5. Thoſe, which have not any evident *chemical* effect on the ſyſtem, which do not quickly nor violently exhauſt irritability, and which alſo do not afford much nutriment to the body, and, at the ſame time, have

have tonic effects on the muſcular fibre; ſuch as the cortex peruvianus, ferrum in its different preparations, &c.

Though the five preceding claſſes comprehend every ſtimulus with which we are acquainted; yet experience renders it neceſſary to form a ſeparate claſs, whoſe action ſeems entirely confined to the nervous ſyſtem; theſe chiefly conſiſt of the ſtimulants included in the 3d claſs, when exhibited in ſmall doſes, or when thoſe of the mind are excited in a moderate degree; nothing elſe can explain the pleaſant effects ſmall doſes of opium produce in *Typhus*, but that its action is entirely confined to the nervous ſyſtem; we ſee a ſtate frequently occur in *Typhus*, when the muſcular action, or the irritability, is much exhauſted, and not eaſily acted upon by ſtimulants; and yet, at the ſame time, a ſmall doſe of opium has an evident effect on the nervous ſyſtem.

As there is no general rule without ſome exceptions, as there is no theory, even truth itſelf, which "is armed at all points," and which does not admit of ſome variety or exception, ſo, on this occaſion, it muſt be anticipated, that the nervous ſyſtem does not *always* ſuffer an equal exhauſtion of its power, with that of the muſcular fibre, and may, therefore, apparently be comparatively accumulated, when the irritability is exhauſted. Perhaps this fact may be explained by an obſervation, which, in this place, it ſeems proper to mention, that ſome bodies from the earlieſt infancy, do not only differ, with reſpect to the proportional powers of excitability of the nervous, and of irritability of the muſcular fibre; but alſo with reſpect to the degree of both theſe powers, compared with thoſe of another body; and therefore, in ſome, the ſtate of healthy irritability, which I have ſuppoſed to be 50*, will, in ſome bodies, be at 60, and in ſome, at 40;

* See Scale B.

40; and muſt be conſidered accordingly in the leſſened or encreaſed ratio.

Having taken a conciſe view of the different ſolids of the human body, of different ſtimulant powers which act on theſe ſolids; I will next proceed to give an explanation of the Scales, A. and B.

The human fœtus in utero, about the concluſion of the ninth month after impregnation, is a compound of matter ſo organized, as to be capable of being acted upon by various ſtimuli, neceſſary to the continuance of life; and immediately on its evolution, the firſt ſtimulus it receives, (excluſive of the additional circulating blood) is a quantity of atmoſpheric air into the lungs; this, with the addition of ſome milk, or mild food, taken into the ſtomach, is all the ſtimulus it ſeems capable of receiving, at this period, conſiſtent with life and health; the external ſenſes cannot bear any ſtrong action on them, particularly the

the eye, which cannot bear the ſtimulus of light. In this ſtate then, there is evidently the greateſt accumulation of irritability; the ſmalleſt ſtimulus whatever, even that of air, and the mildeſt food, ſo readily acts upon it, as to produce almoſt conſtant ſleep; with every application of ſtimuli therefore, the irritability is eaſily exhauſted, and the ſtate of ſleep is the immediate effect; and notwithſtanding the ſtate of ſleep tends always to reſtore the irritability of the ſyſtem exhauſted by ſtimuli, yet that it never entirely reſtores the exhauſted irritability, will appear ſufficiently evident, when it is conſidered, that the degree of accumulation of irritability, is leſs and leſs every day, from infancy to puberty, which is proved by the known circumſtance of the ſame ſtimulants having a leſſer effect every day; as well as by the encreaſing power of bearing the action of ſtronger ſtimuli; and this daily and rapid effect of the application

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tion of the mildeſt ſtimuli, in leſſening the accumulation of irritability, from infancy to puberty, ſeems only conſiſtent with health and ſtrength.

From the age of puberty to that of 35 years of age, the ſame effect takes place, as may be proved by the ſame obſervations, only in a degree leſs rapid. At this period of life, viz. about 35 years of age, it appears that there exiſts, as it were, a juſt and healthy equilibrium, between the powers of the ordinary ſtimulants, and the power of irritability in the muſcular fibre; yet at the ſame time, as the continued application of the ordinary ſtimuli, is abſolutely neceſſary to life and health; ſo the daily effects of theſe, is a ſmall degree of exhauſtion of irritability, and the ſtate of healthy ſleep. But again, according to the organization of our bodies, though ſleep reſtores the healthy ſtate of irritability in a certain degree, yet it ſeems never to reſtore actually

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the former ſtate; a ſmall degree of exhauſtion of irritability taking place every year, and this too only conſiſtent with health, as the ſtate which is healthy at 15, will be diſeaſe at 50 years of age. This gradual change, conſequently, not only indicates the power of bearing, but alſo the neceſſity of the application of ſtronger ſtimuli, as we advance in life, until, at laſt, that ſtate takes place, which we call old age, which is little affected by the ordinary, and ſcarce ſenſible of the ſtronger, ſtimuli; and as theſe gradually ceaſe to make the impreſſions neceſſary to the continuance of life, the death of old age muſt take place. And this event perhaps would ſeldom be extended to the period commonly ſuppoſed*, if the ſame mild, ordinary, unvaried ſtimuli,

* The human body, being accuſtomed for many ages to luxury and intemperance, has ſo degenerated from the ſtate in which it muſt have been originally formed, that it requires now more than the power of the milder ſtimuli, to protract life to the common period of old age.

were

were conſtantly applied, but rather at an earlier period, unleſs ſome additional and ſtronger ſtimuli, as are uſually and generally applied in declining life, did not act on the ſtate of exhauſted irritability, no longer capable of being acted upon by ordinary ſtimuli.

Thus I have endeavoured to ſhew that the different ſtates of irritability, as marked in the Scale A, attend the different periods of life from infancy to old age; and alſo, that theſe different ſtates of irritability are produced by the application and action of ſtimulant powers.

From theſe views it eaſily follows, that, if a given quantity of mild and moderate ſtimuli can produce, in a given number of years, the ultimate effect, death; ſo, the ſudden application and action of violent and powerful ſtimuli, ſuch as vinous and ſpirituous liquors in large quantities; and the contagion of the plague, *Typhus*, &c.

will produce the ſame effect, in a very ſhort ſpace of time.

As it has alſo been ſhewn, that the application of mild ſtimuli, to a certain degree, is neceſſary to the continuance of health and life, ſo it will as eaſily be underſtood, that the want or abſtraction of ſuch ſtimuli, for a length of time, will not only produce death, but muſt alſo occaſion an intervening ſtate of irritability, the *reverſe* of that produced by the *application* of ſtimuli, either ordinary or powerful; theſe two different ſtates I have accordingly pointed out in the Scale. The ſymptoms and effects of the accumulated ſtate I will more particularly explain, when ſleep, one effect of that ſtate, is conſidered. For which purpoſe I have ſketched another Scale, B; it is drawn applicable to that period of life, about 35, when in general the equilibrium between the *venous* and *arterial* ſyſtem takes place, and the balance between the waſte

and

and growth of the body, and the aliment conſumed, is equal, and when it is ſuppoſed, the degree of irritability, conſiſtent with health, is at 50 in the Scale.

At every period of life, ſleep ſeems to be the effect, either of the exhauſtion, or accumulation, of the excitability of the nervous, and of the irritability of the muſcular fibre, produced by the application, or abſtraction, of ſtimuli. Of ſleep, the effect of the application of ſtimuli, there appears to be two different ſtates; the one healthy, the other morbid; healthy ſleep is the natural effect of the application of mild and moderate ſtimuli; morbid ſleep, the effect of very violent ſtimuli, long, or ſuddenly, applied; it ſeems alſo a law in the animal œconomy, that the ſtate of ſleep does not take place, when the irritability is *much* exhauſted by violent ſtimuli, whether applied to the body, or to the mind. Opium in large doſes is an inſtance of the one, and violent paſ-

ſions of the other, as well as the contagion of *Peſtis*, *Typhus*, and other diſeaſes, which latterly produce watchfulneſs and delirium.

Common or ordinary ſleep, produced by the application and action of ſtimuli, from what has been ſaid, ſeems therefore to be a ſtate, the reſult of a law of the animal œconomy, which takes place in order to remove the effects of ſtimuli applied, and to reſtore, as much as poſſible, the healthy ſtate of the irritability and excitability of the ſyſtem; as during that ſtate, all ſtimuli ceaſe to act, all objects ceaſe to make any impreſſion; while the atmoſpheric air is the only foreign power, which then continues to be applied, at once carrying off what is morbid from the lungs, and aſſiſting, with the food taken into the ſtomach, to ſtimulate the heart and arteries to carry on the circulation, and to ſupply the waſte occaſioned by the common ſecretions and excretions of the day.

Sleep,

Sleep, both healthy and morbid, I have yet only conſidered as the effect of irritability and excitability exhauſted, to certain degrees; but it will alſo eaſily appear, that ſleep is often the effect of *accumulated* irritability, and in general in the ſame ratio, as the former, in the manner I have pointed out in the Scale.

The exiſtence of whatever daily occurs to the obſervation of all, it is ſurely unneceſſary to prove, but not ſo, to endeavour to explain. It ſeems equally a law of the animal œconomy, that the ſtate of ſleep ſhall take place, when the ordinary ſtimuli, thoſe of air and light always excepted, have been for a ſhort time withheld, as well as when they have been applied. Though ſleep takes place under both theſe circumſtances, it is ſelf-obvious, that the ſtates themſelves muſt be exactly contrary. The ſtate of ſleep to which I allude, takes place, generally, I may almoſt ſay, inevitably, in

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every perſon, who abſtains from food for 24 hours; and alſo at the ſame time, avoids the application of any ſtimulus to the body, ſuch as exerciſe, ſuch as that of agreeable converſation, or of books. This ſleep again we ſee take place in thoſe, who have, from want of food, been obliged to abſtain from it, for a greater length of time, notwithſtanding the application of the ſtimulus of exerciſe to the body, or converſation to the mind; and ſuch unfortunate perſons as have died of hunger, generally expire in a ſtate of ſleep. This is well known to thoſe, who have been ſhipwrecked, and have experienced want of proper food, for a conſiderable length of time. Of every degree of ſuch a ſtate of ſleep, the caſe of Capt. Bligh and his company in the Bounty's Launch, is a ſtriking, and fair example. In them, the irritability of the ſyſtem was, at firſt, no more accumulated, than to that degree, which produced

ſleep,

ſleep, that refreſhed them; but ſoon afterwards, the continued abſtraction of a ſufficient portion of food, together with the effects of cold and moiſture, produced ſuch a degree of accumulated irritability, that they did not enjoy much ſleep; indeed, at this period, Capt. Bligh ſays, he "almoſt lived without it." That the ſtate of Capt. Bligh, and his company, was, at this time, *that* of accumulated irritability, is proved, by *one* tea-ſpoonful of rum producing effects, nearly equal to thoſe, which it would require *twenty* to produce, in their uſual healthy ſtate. But it is only when the accumulation of irritability takes place in a very great degree, ſuch as I have ſuppoſed, and pointed out in the Scale B, that apoplectic ſleep, or ſleep terminating in death, enſues; ſuch is the common effect of extreme cold to travellers in winter: ſuch Capt. Bligh, at laſt, experienced in his men, when they had long ſuffered the abſtraction

tion of proper ſtimuli.—Capt. Bligh has theſe words:

" *Monday, 8th June.* This day the ſea ran very high, and we were continually wet, ſuffering much cold in the night.

" Amongſt moſt of the men I obſerved more than a common inclination to ſleep, which ſeemed to indicate that nature was almoſt exhauſted.

" *June 11th.* Extreme weakneſs, ſwelled legs, hollow and ghaſtly countenances, great propenſity to ſleep, with an apparent debility of underſtanding, ſeemed to me melancholy truths of their approaching diſſolution."

That Capt. Bligh himſelf did not ſuffer ſuch effects from the ſame cauſes, will eaſily be explained, when we conſider, that he enjoyed the influence of many ſtimuli, to which his men were comparatively ſtrangers. I mean the ſtimulus of ſelf-approbation,

tion, and that he was the means, through Providence, of ſaving the lives of ſo many perſons, and all the ſtimuli, induced by the hopes, and the proſpect of approaching pleaſure and honour, in his native country.

In a leſs accumulated ſtate, than this I have juſt deſcribed, ſleep ſeems capable of diminiſhing the accumulation of irritability, and, conſequently, more or leſs reſtores the healthy ſtate; and this is proved by many obſervations, and by one in particular, that ſleep, in ſuch ſtates, ſupplies the want of food; the appetite for it, which was experienced before ſleep, not being felt immediately after ſleep; indeed there are inſtances recorded of perſons ſleeping for many days, and even months, and at the ſame time, neither taking, nor feeling the want of food. Each night is a proof of the ſame, every one in the morning, having leſs appetite for food, than they would

have felt, had they been in a ſtate of health, and waking during the night.

From the whole of theſe obſervations, it will appear, that a certain degree of accumulated irritability, may produce healthy ſleep; a greater degree, watchfulneſs, or morbid ſleep, according to the cauſes; and a greater degree, that ſtate, which ſleep is no longer able to reſtore to health, and which terminates in death.

It is then, I think, ſufficiently evident, that at all periods of life, the abſtraction of ſtimuli, always ſuppoſing that of reſpiration to continue, will, in exact proportion to ſuch abſtraction, and to the ſtate of irritability preſent, render the body more ſuſceptible of ſtimuli, or will accumulate irritability; that in infancy, when the irritability is already much accumulated, any abſtraction of ſtimuli cannot be continued long, without exhauſting it entirely, or producing death. That in proportion to the

the advance of age, till the period 35, ſuch abſtraction can be endured with leſs danger to life; this period then of 35, will be the ſtrongeſt in general in human life; the degree of irritability is then, at the fartheſt, from each extreme of death; the ſyſtem being capable of a greater accumulation, as well as of a greater exhauſtion, than at any other age. That after this period, 35, it appears, that the ſyſtem requires the application of ſtimuli, in a greater degree, to preſerve the ſtate of health; which ſtate muſt, from what has been ſaid, be about one degree higher, or more exhauſted every year, ſo that the degree 50, which is ſuppoſed to be the healthy ſtate at 35, will be a ſtate of accumulation, or 10 degrees below health at 45, or 50 years of age, and ſo on in the ſame ratio; the point of death, being 10 degrees higher from the extreme of accumulation, it being impoſſible to produce

the degree of accumulation, which is in infancy, in one of 50 years of age.

Another general concluſion may alſo be drawn from what has been ſaid; that the application of ſtimuli muſt always be varied with reſpect to quantity, according to the different ſtates of irritability.—When it is much accumulated, as in infancy, or in a more advanced age, occaſioned by the abſtraction of ſtimuli, the moſt gentle and mild ſtimuli muſt be firſt applied, and gradually encreaſed; but when, on the contrary, the irritability is much exhauſted, more powerful ſtimuli, and in greater quantity, muſt be applied. In proof of the firſt, we have only to conſider, the common ſtate of any animal, almoſt dead with want of food; if to the animal, in this ſtate, much food be haſtily given, it generally dies; but if it be carefully, and gradually applied, the animal generally recovers the powers of life. Perſons frozen with cold, or apparently dead

by

by drowning, are all inſtances of the ſame; to theſe, it is now known, the moſt natural and mild ſtimuli muſt be firſt applied.—To bodies frozen, the application of ſnow with friction, is more ſalutary than any artificial warmth; if ſuch be applied, it is well known, Sphacelus enſues.

Inſtances in proof of the latter, or that the oppoſite means may be uſed, when the irritability is exhauſted, are alſo common. We can apply, not only with ſafety, but with the beſt effects, ardent ſpirits, to a part burned or ſcalded; but ſuch application, to a body frozen, induces gangrene. We *can* apply cantharides, and large doſes of opium, to a perſon in a ſtate of exhauſted irritability in *Typhus*; but we cannot, with ſafety, apply theſe ſtimulants to an infant. To the body of a perſon apparently dead by drowning, which is then in a ſtate of accumulated irritability, produced by the total abſtraction of every ſtimulus, the moſt

moſt gentle and natural heat is firſt applied, and the common ſtimulus of reſpiration is endeavoured to be reſtored: when that can be effected, ſuch a change takes place in the ſtate of irritability, according to the age of the perſon, that more powerful ſtimulants can be then ſafely employed.

When we conſider theſe two oppoſite ſtates, and find that both cold and heat will occaſion inflammation; may not there be two different ſtates of inflammation, and each conſequently require oppoſite treatment? Of this I will only name one inſtance: There is a ſpecies of opthalmia, which requires blood-letting, and the anti-phlogiſtic regimen; and there is another, ſuch as ſcrofulous opthalmia, that requires ſtimulant applications, ſuch as mercury, and even ardent ſpirits, diluted with water.

Before I quit this part of the ſubject, I may take notice of a peculiar ſtate of the ſyſtem, called *Hectic*. Every circumſtance proves

proves this ſtate, to be that of accumulated irritability; the leaſt ſtimulus, whether applied to the mind, or to the body, having conſiderable effects on thoſe affected with *Hectic.* Such a ſtate of the ſyſtem, at firſt ſight, would ſeem eaſily changed to that of health, by the application of proper ſtimulants; but in this peculiar ſituation of the body, there always exiſts ſome cauſe, abſorption of pus, or injured organization of ſome vital organ, or violent affections of the mind, which ſo conſtantly, and rapidly, accumulate irritability; together with the appetite being much impaired, that no healthy ſtimulus can be applied in ſufficient quantity, to prevent the daily encreaſing accumulation, which ſoon arrives at that point, when all the organs neceſſary to the continuance of life, can no longer perform their functions, and ceaſe to act.

Having now pointed out different ſtates of the irritability of the muſcular fibre, and con-

conſequently, of the excitability of the nervous power, as produced by the application and abſtraction of ſtimulant powers, I will next make a very few remarks on the different exiſting quantities of *carbone* and *hydrogen*, which I have ſuppoſed to correſpond with the different ſtates of irritability, in Scale B. In this I have placed *carbone* and *hydrogen* in a ſtate of accumulation, in proportion to the ſtate of irritability, and that they both accumulate equally, according to the ratio of their exiſting proportions in the oppoſite ſtates of irritability. The data, on which this ſuppoſition is founded, I will endeavour to enumerate, which, I hope, will at leaſt prove, that if there is not a poſitive accumulation of *carbone* and *hydrogen*, in the extreme of each of theſe ſtates, there is a comparative accumulation, or an over-proportion of both, to the proportion of *oxygen*, neceſſary to preſerve the equilibrium of health. The ana-

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lyſis of animal ſubſtances, proves the exiſtence of *carbone* and *hydrogen*, in conſiderable proportions, in all animal matter; and the circumſtance of bodies, which have been interred, and afterwards found, in the ſtate of animal fat*, proves not only the ſame, but alſo, that *carbone* and *hydrogen* remain, after the *oxygen* has entirely diſappeared, as animal fat is known to conſiſt of 21 parts of *hydrogen*, with 79 parts of *carbone*; and the reaſon, that every animal body does not terminate in this ſtate after death, and when it is no longer under the action of *oxygen*, Lavoiſier has ſhewn, to be occaſioned by the preſence of *azote*, which, in theſe inſtances, where animal fat was formed, had been, by a proceſs, not yet ſufficiently known, entirely diſengaged.

That the exiſtence of *oxygen* in the

* "Rapport ſur les Exhumations du Cimetiere et de l'Egliſe des Saints Innocens, &c." Par M. Thouret. Med. Facts and Obſervations, Vol. 1, page 186.—Lavoiſier's Elements of Chemiſtry.

healthy living body, and its abſence, in a certain degree, whenever a putreſcent ſtate takes place, and that this ſtate begins, when the healthy equilibrium of *oxygen*, with *carbone* and *hydrogen*, is deſtroyed, ſeems more than probable, from a variety of obſervations.

It has been already obſerved, that *oxygen* is received into the lungs in reſpiration; and Lavoiſier has ſhewn, that the red globules of the blood contain a very large quantity of *oxygen*; whoſe experiments alſo, with thoſe of Mr Hewſon, Dr Prieſtley, and others, prove, that the blood receives its florid colour, in paſſing through the lungs; that the blood undergoes a remarkable change of colour, when circulating in a living animal; that the vivid arterial blood, in its paſſage through the extreme branches to the venous ſyſtem, acquires a deep livid hue, and again receives its florid colour in the lungs. Mr Hewſon has

has alſo perceived the blood, in the right auricle, much darker, than that, in the left; and it is very well known, that blood drawn from a vein, and allowed to coagulate, in atmoſpherical air, aſſumes, on its upper ſurface, a more florid colour, than that, of its under ſurface; but if the under ſurface is expoſed to the air, it alſo ſoon loſes its dark colour, and becomes more florid. The experiments of the ſame perſons have alſo proved, that the blood is red only in proportion, as it is in contact with dephlogiſticated air, or the *oxygen gas* of Lavoiſier more properly; and that it loſes its redneſs, when expoſed only to *hydrogen*, or *azotic gas*, or the *carbonic acid*, or to any unreſpirable air, or even in the exhauſted receiver of an air-pump: and that, on the contrary, it receives its red colour, when again placed in contact with *oxygen gas*, or with atmoſpherical air; and that this reſtoration of the red colour, is conſtanly attended

tended by a diminution in the volume of the air. From all theſe obſervations, it may ſafely be concluded, that in exact proportion to the encreaſe of the dark colour of the blood, is the deficiency of *oxygen*, and the encreaſe of the tendency to a putreſcent ſtate; and that *oxygen* is the general and only corrector of ſuch a tendency, which is ever preſent, even in the healthy body, and very rapid in ſome diſeaſes, ſuch as *Peſtis* and *Typhus*.

Having now given a conciſe view of the obſervations on which I was induced to place the exiſtence of *carbone* and *hydrogen*, according to the degrees in the Scale B*, I will next proceed to apply the reſult of the whole, to the explanation of the cauſes and cure, and cauſe of death, in *Typhus*.

* It will be of courſe underſtood, that the *quantities*, or even the *proportions*, given in the Scale, are by no means intended as *poſitive*—to eſtimate the *quantities*, appears an unneceſſary, and perhaps, an impoſſible, taſk; and the proportions, therefore, are only intended to be comparative.

I conſider

I conſider it unneceſſary to make any remarks on the different ſtates of arterial and venous *plethora*, which I have marked in Scale A, as they have been long eſtabliſhed in phyſiology; I have only noticed them, as they ſeemed connected with the ſubject of irritability, to render the Scale more complete.

Having left one, I now enter into another extenſive field of obſervation and argument, on the cauſes which produce, on the immediate or proximate cauſe, and on the cure of *Typhus*; before I attempt the explanation ef either of theſe, it is neceſſary that I ſhould firſt endeavour to ſhew, that *Typhus* is, in every view, a diſtinct genus from any other fever*; and that it is very

* On this ſubject, I have an object ſtrongly at heart, which is, to baniſh the idea of all fevers being of the ſame genus, and of each being only ſpecies and varieties; and alſo that of the ſynocha, or continued fever, ariſing from the ſame cauſe, as that of the intermittent; and I hope, at ſome future period, to be able to accompliſh this wiſh.

properly

properly conſidered ſo, will, I think, be eaſily proved, by taking into conſideration, the definition of *Typhus*, as given by Dr Cullen:

"Morbus contagioſus; calor parum auctus; pulſus parvus, debilis, plerumque frequens; urina parum mutata; ſenſorii functiones plurimum turbatæ; vires multum imminutæ."

Typhus being a contagious fever, is alone ſufficient, to induce every phyſician to conſider it a diſtinct genus from any other, as no other fever, whether intermittent, remittent, or continued, has this characteriſtic, except *Peſtis*, which ſeems to be a violent ſpecies of *Typhus*, or the *Typhus gravior*, of Dr Cullen*.

As the *Synocha* of Dr Cullen is the fever,

* Many of the exanthemata are contagious, but ſuch cannot be oppoſed here with any propriety.

from

from which *Typhus* is ſuppoſed to be improperly conſidered, as a diſtinct genus, and as, by ſome, even the exiſtence of *Synocha* has been doubted; with this fever, therefore, I will draw a parallel, with a view, not only of proving *Typhus* a diſtinct genus, but alſo, the exiſtence of ſuch a fever, as the *Synocha* of Dr Cullen.

Typhus, as has been already taken notice of, is a contagious diſeaſe; *Synocha* is never contagious; in *Typhus*, "calor *parum* auctus," is perceived; in *Synocha*, "calor *plurimum* auctus;" in *Typhus*, "pulſus parvus, debilis, plerumque frequens;" in *Synocha*, "pulſus frequens, validus, et durus;" in *Typhus*, "urina parum mutata;" in *Synocha*, "urina rubra," (et parca, might be added); in *Typhus*, "ſenſorii functiones *plurimum* turbatæ, vires multum imminutæ;" in *Synocha*, "ſenſorii functiones *parum* turbatæ."

The ſtriking contraſt of theſe ſymptoms, and their peculiarity, is, I think, ſufficient

to

to prove, the propriety of conſidering *Typhus*, a diſtinct and ſeparate genus from *Synocha*, and from any other fever.

With reſpect to the exiſtence of ſuch an idiopathic fever as *Synocha*, I will only ſay, that, independent of the experience of Dr Cullen, and others, who have aſſured me, they have frequently ſeen it; I can aſſert, that I have, more than once, ſeen a fever, exactly conſonant to the definition of the genus *Synocha* of Dr Cullen, and of the *idiopathic* character of fever. It may be objected, to the parallel I have drawn, that both the definitions are given by an author, who has placed, in his noſology, another genus of fever, differing from both *Synocha* and *Typhus*, and yet combined of both: But, I believe, moſt phyſicians now allow, that the *Synochus* of Dr Cullen is a genus entirely ſuperfluous; I have been informed, that Dr Cullen himſelf doubted the propriety of eſtabliſhing ſuch a genus;

but

but, being a clear noſologiſt, he was willing to give his pupils every form of fever, which he had ſeen; that the knowledge might check the ardor of the young, and regulate the practice of the incautious, and inexperienced. From every obſervation I have made, among a very great number of patients, I have ever had reaſon to believe, that the difference in the habit of body, was the only cauſe of *Typhus*, ſometimes immediately aſſuming all the ſymptoms peculiar to itſelf, and ſometimes of being preceded by ſome ſymptoms of *Synocha*. To exemplify this, we need only ſuppoſe, (independent of the difference of temperaments) that, if a ſtrong and robuſt man is ſeized with the contagion of *Typhus*, the ſymptoms, at firſt exhibited, will agree very much with thoſe of *Synocha*, and be very different from thoſe firſt exhibited in a body weak and reduced.

The remote cauſes of *Typhus* are thoſe,

which pre-diſpoſe the body to the diſeaſe, and thoſe which excite it; of the latter, contagion is allowed to be a common cauſe. Though *Typhus* is conſidered as a diſeaſe produced by contagion, yet this contagion, like many others, may be generated in the body, the effect of the concurrence of certain pre-diſpoſing, and exciting cauſes, independent of foreign contagion; this, I think, cannot admit of any doubt; ſome of theſe cauſes I will ſhortly enumerate.

The more the irritability is accumulated by any of the cauſes mentioned in Scale B, by the abſtraction of the ordinary and proper ſtimuli of food, by depreſſing paſſions, or by diſeaſe, the more eaſily it will be affected by contagion: all thoſe cauſes therefore, may be conſidered as pre-diſpoſing cauſes of *Typhus*, and the ſtate of accumulated irritability, the pre-diſponent ſtate, being moſt liable to the action of contagion, or with the addition of other exciting cauſes,

cauſes, generating the diſeaſe. Of theſe, the principal are, impure air, want of cleanlineſs, and of exerciſe, and cold with moiſture.

The inſtances we have of theſe cauſes producing *Typhus*, are too numerous to mention, particularly that of impure air, to which alone the fever can be attributed in jails, hoſpitals, ſhips, &c. Impure air, or air containing an over-proportion of *azote*, or of any unreſpirable air, and conſequently, not ſufficient *oxygen* to carry off the accumulating *carbone* of the ſyſtem, may eaſily be underſtood to act as an exciting cauſe. The over-proportioned *azote* (the equilibrium being deſtroyed by the deficiency of *oxygen*) may combine with the *hydrogen* of the ſyſtem, and produce a morbid volatile alcali; or the want of cleanlineſs alone, by generating, or accumulating the *hydrogen* and *carbone* of the ſyſtem, and thereby deſtroying the equilibrium, and alſo by exhauſting the *oxygen* of the ſurrounding at-

moſphere, may ultimately produce the ſame effects, and the fever called *Typhus*, be produced.

Whether then we take a view of the effects, which theſe exciting cauſes, or which the contagion, when already generated and applied, produces on the body, we cannot heſitate to pronounce all of them to be highly ſtimulant, and that they will quickly exhauſt the irritability of the ſyſtem. The knowledge which we now poſſeſs of the powers of *hydrogen* and *carbone*, entirely leaves the reſult beyond all doubt whatever. From theſe views, the *Proximate* cauſe of *Typhus* will be eaſily underſtood; an *over-propertion* or *accumulation* of *carbone* and *hydrogen*, and *an exhauſted ſtate of irritability*.

From the remarks I have already made, on the effects of *oxygen* on the blood, both in the ſtate of circulation, and when drawn from a vein, and allowed to cool, from the difference of the colour of the returning blood,

blood, with that, which has juſt paſſed through the lungs, and from our knowledge, that the red globules are *oxyids*, and from the ſimilar appearance, which the blood, in a perſon labouring under *Typhus*, has with the returning venous blood, and from the anxiety in reſpiration, which they, who labour under *Typhus*, always diſcover, we can have little doubt, I think, that the morbid accumulation of *carbone* and *hydrogen*, or the deficiency of *oxygen*, is the cauſe of the ſymptoms of *Typhus*, the principal of which are, beſides thoſe common to *Pyrexia*, univerſal debility, and a rapid tendency to a putreſcent ſtate. *Oxygen* is the univerſal antiſeptic of all Nature; *carbone* and *hydrogen*, are, with *azote*, the putrefactive principles; with the decreaſe of *oxygen*, will encreaſe the tendency to putrefaction, and with the encreaſe of the tendency to putrefaction, will the irritability be exhauſted, and ſymptoms of debility,

in

in both body and mind, be progreſſively evident.

The indications of cure in *Typhus*, eaſily follow the knowledge of the cauſes; theſe are therefore three:

1. To avoid the remote cauſes.
2. To remove the *Proximate* cauſe. And
3. To reſtore the healthy ſtate of the irritability of the ſyſtem.

The knowledge of the remote cauſes may enable us to anſwer the firſt indication, by every means being taken to avoid them.

The *Proximate* cauſe, or the accumulation, or over-proportion, of *carbone* and *hydrogen*, can only be removed, as will appear, from all that has preceded, by the application of *oxygen* in ſufficient quantity, to correct this morbid accumulation, and to reſtore the ſtate of healthy equilibrium*.

Oxygen

* It is with much pleaſure that I have perceived an ingenious

Oxygen taken into the ſtomach, in the combined ſtate of many different acids, may anſwer this intention, but in the ſtate of the acid of *nitre*, combined with *potaſh*, ſeems to me the moſt eaſy, and moſt powerful form of exhibiting it; the proceſs for obtaining pure *oxygen*, in the ſtate of *gas*, in order to throw it into the ſyſtem, by the lungs, would be not only tedious, but difficult. In the ſtate therefore, of the neutral ſalt, *nitre*, it appears to me at preſent, from every obſervation, to be the moſt effectual mode of throwing it into the ſyſtem. Mr Wood, ſurgeon, in Berwick, has uſed this medicine in this fever, invariably during a long and extenſive practice. In a letter, which I lately received, he uſes theſe words: " I never kept any minutes of the number

nious attempt by Dr Crawford, to apply the reſult of our improved chemical knowledge, to pathological purpoſes. Vid. Phil. Tranſ. of the Royal Society of London, vol. lxxx. year 1790, Part II. and Medical Facts and Obſervations, vol. ii. page 182.

of

of patients to whom I gave *nitre* in fever, but this I am ſure of, that I have given it in fever for more than thirty years, with incredible ſucceſs, and in that time to a very great number of patients, in every rank, eſpecially among the lower ranks, and to a great number of ſoldiers and ſailors. If the fever did not come to a criſis before the 13th day, I generally gave Dr James's Powder, beginning with five grains to a grown perſon, but I had not often occaſion to give it; if you try *nitre*, you will find it a wonderful medicine in fever; give it three or four times a day."

I have lately exhibited *nitre* in the form of ſolution, to 15 patients, labouring under *Typhus;* many of whom, when I firſt ſaw them, had all the ſymptoms, in a very violent degree; I did not give to any of theſe, any antimonial, but I immediately exhibited the ſolution of *nitre;* in two or three of them, the pulſe, which was from

100 to 130, was diminiſhed in frequency, and encreaſed in ſtrength, before the expiration of the firſt 24 hours; the change, indeed, was often ſo great, that I rather ſuppoſed it to be the effect of ſome other cauſe, than of the operation of the ſolution; to convince myſelf of this, I gave it to two patients, whoſe pulſes were from 120 to 130, and found, on my viſiting them the next day, both reduced below 100; all of the number I mention, (and indeed I have not loſt a patient in *Typhus*, ſince I have given the *nitrous* ſolution*) recovered before the 10th day, ſome on the 5th, 6th, and 7th. I ſhall certainly wait for the reſult of farther experience, before I eradicate from

* The following was the formula commonly uſed:

R. Nitri Purificati drachmam unam cum ſemiſſe,
Aquæ Diſtillatæ uncias ſeptem;
Solve ſalem, et adde
Syrupi Sacchari albi unciam unam,
Tincturæ Lavendulæ Comp. drachmas duas; miſce.
Capiantur una, vel duæ unciæ, ſecunda, vel tertia, quaque hora.

my mind the doctrine of *critical days*, or that, of the continued ſucceſſion of paroxyſms, in *Typhus*, or *Synocha*; but, at the ſame time, from the view I at preſent have of the *Proximate* cauſe of *Typhus*, and from the effect of *oxygen*, in entirely baniſhing every febrile ſymptom in a few days, I cannot but feel a doubt of any good foundation for ſuch doctrines. If the *Proximate* cauſe, which I have given, is true, it neceſſarily follows, that the diſeaſe muſt diſappear, the moment the cauſe is removed, whether in the firſt hour, or on the 20th day; thoſe diurnal revolutions, however, which are perceived to take place, in a ſtate of health, may eaſily be ſuppoſed to be more apparent in the ſtate of fever; I mean the ſtates of remiſſion, and exacerbation.

The above reſult of the practice recommended in *Typhus*, was written in the month of July, 1792; between which period

riod, and the firſt of December, I have tried the *nitrous* ſolution, to 35 patients, who were affected with all the marked ſymptoms of *Typhus*, in a violent degree, and to 13, who were affected in a leſs violent degree, *all of whom recovered*, and the greateſt number, in leſs than ten days.

Previous to the practice which I now purſue, I never viſited a patient in *Typhus*, without experiencing ſome of thoſe feelings, which the phyſician is obliged to ſuffer, when he viſits a patient labouring under confirmed *Phthiſis*. I could not but feel much deſpair in the ſucceſs of a method of cure, which has ſo repeatedly failed; beſides theſe feelings, having imbibed the idea of the neceſſity of the fever continuing for 14, or ſome *certain* number of days, I ſat down before it, as it were, to commence a ſiege, and by the force of example, I ſteadily believed in this theory, and perſevered in the practice, until the

early ſun-ſhine of returning health baniſhed from my mind the error of the one, and the *ſtrongeſt of all human convictions* ſeemed to prove the inefficacy of the other.

On this ſubject, and in this place, let me do every homage to the *judgment*, as well as to the *memory*, of the Man, who *was* (alas!) univerſally acknowledged to be the firſt Philanthropiſt of the age; the preſent practice, in the *Typhus* of the gaols, did not eſcape his all-attentive eye*. "No *effectual* reform," he ſays, "will be made in our priſons, till the root of theſe evils" (immorality in its various forms) "be cut off, which, from the cloſeſt obſervation, I am convinced is *the vice of drunkenneſs*. To this end, reſtraints muſt be laid, which will, to many, I am ſenſible, appear harſh and ſevere; but in this matter, there is no *medium*; any indulgence to particular claſſes of

* See the "Account of the principal Lazarettoes in Europe," by JOHN HOWARD.

priſoners,

priſoners, will *ruin* the *whole* deſign. It will, in my idea, be abſolutely neceſſary, to prohibit the introduction of any kind of liquor, except milk, whey, butter-milk, or water, into gaols.—With regard to the health and real comfort of priſoners, I am perſuaded, they would be promoted by ſuch a prohibition." And, in a note, he adds, " If Gentlemen of the Faculty, and others, ſtill object to the excluſion of all fermented liquors from gaols, under the idea, that their uſe is in ſome meaſure neceſſary, as *antiſeptics*, I would deſire them to conſider, that by the propoſed dietary, priſoners are to have a warm diſh, chiefly of vegetables, twice a day;—and that of female priſoners, who in general drink very little beer, a ſmall proportion, compared with the men, die in priſon. I am ſenſible my ideas are contrary to the preſent *faſhionable* mode of preſcription, which, I am perſuaded, *confirms* the habit of drinking

ing ſtrong liquors, both in town and country; but may I not hope, that the *opinions* of Medical Gentlemen will, in time, alter as *much* on this ſubject, as I have ſeen in their treatment of the Small-pox?"

I may perhaps take notice in this part, of other remedies recommended in *Typhus*. Fixed air has been ſaid to have been uſed with ſucceſs; it will be obvious, however, that the tonic, or antiſeptic powers of fixed air, can only be derived from the *oxygen* of this acid; the *charcoal* cannot poſſeſs any ſuch power, it being compoſed by analyſis and ſyntheſis, of 72 parts of *oxygen*, with 28 of *charcoal*.

Many neutral ſalts likewiſe, which have been found uſeful in *Typhus*, can only have their good effects from the *oxygen*, with which they are in a ſtate of combination. Thus *alum* owes its powers to the *oxygen* of the ſulphuric acid, which it contains in great quantity.

In

In order to explain every myſtery, and convince thoſe who may be attached to an old practice; I will beg leave to enquire, if, in thoſe patients who have recovered from *Typhus*, by the uſe of the bark, as it may have been ſuppoſed they have, any *credit* was ever given to the acid in alum, or to the vegetable acids of the orange, or the lemon, or of other fruits, which were at the ſame time exhibited with the bark; or to the *local ſtate* of the ſurrounding atmoſphere?

The third indication of cure, which I have named, is to reſtore the healthy ſtate of the irritability of the ſyſtem; perhaps this indication in general may be altogether ſuperfluous, as the exhauſted ſtate of irritability in *Typhus*, is the effect of the ſtimulant action of accumulated *carbone* and *hydrogen*, and conſequently, when the equilibrium is reſtored, by the application of *oxygen*, the irritability will, by the powers of the animal œconomy, be naturally reſtored to the ſtate of health.

But

But when, on the contrary, the morbid effects of accumulated *carbone* and *hydrogen* continue to encreaſe, from the continuance of their accumulation, the irritability will be at laſt ſo far exhauſted, as to produce the ſtate of death.

But, from this I would not conclude, that the accumulation of *carbone* and *hydrogen*, though it is the *Proximate* cauſe of *Typhus*, to be alſo the cauſe of death in this fever; ſuch accumulation I would only conſider as the cauſe of the exhauſted irritability and excitability, and the *irritability* and *excitability exhauſted*, to be the *immediate* cauſe of death in *Typhus*.

A numerous claſs of ſtimulants, ſuch as wine, brandy, opium, &c. have been given in *Typhus*, with the view* of preſerving and

* In another light alſo, have powerful ſtimulants been promiſcuouſly given, in every caſe of exhauſted irritability, by the rigid followers of the late Dr Brown, with the idea, (the moſt common rock on which ſo many have foundered) that there are only *two ſtates* of the body, and that *that* of exhauſted irritability

and reſtoring the healthy ſtate of the irritability of the ſyſtem; but it muſt appear immediately obvious, from what has been ſaid on the effects of the application of *ſuch* ſtimulants in large quantities, that, although their immediate action is to give to the ſyſtem a degree of energy and excitement, their ultimate effects tend to exhauſt that very power, which is wiſhed to be preſerved and reſtored. Therefore, as ſoon as the effects of excitement produced by one doſe of ſuch ſtimulants are paſt, another doſe is immediately neceſſary; but then it always happens, that the ſecond doſe muſt be ſtronger than the firſt, as, the excitability being more exhauſted, an encreaſed doſe is requiſite to produce the ſtate of

irritability is to be cured, whatever the diſeaſe, by the uſe of ſtimulants. But it ſhould be conſidered, that, although every remote cauſe will produce one or other of theſe two ſtates of irritability, yet the ſame cure is not always applicable, as the cauſes are *different*, and conſequently, the remedies muſt likewiſe be ſo; and beſides, our ſtate of irritability is generally only an effect, not a cauſe; only a conſequence, not the diſeaſe.

excitement, which the firſt doſe produced; the third doſe again, for the ſame reaſon, muſt alſo be encreaſed, and the concluſion, of courſe, muſt be total exhauſtion of irritability, or the ſtate of death, as certainly, as if the ſame ſtimulants were poured into the body, as quickly and regularly, in a ſtate of the moſt ſound health.

From the whole of theſe conſiderations then, it will appear, that thoſe claſſes of ſtimulants can only be continued with ſucceſs in *Typhus*, which have a ſalutary chemical effect on the ſyſtem, whoſe action is not followed by any violent exhauſtion of excitability, or irritability; and thoſe, which at the ſame time, afford ſome degree of nutriment to the body. The 1ſt and 4th claſſes* then, will be more particularly adapted to the cure of *Typhus*. Of theſe, *oxygen* is the firſt; and next, thoſe which afford ſome nutriment to the body, which

* See page 25.

are

are in a ſmall degree ſtimulant, and do not much exhauſt the irritability; of theſe may principally be mentioned, the ſtrong juices of different kinds of animal matter obtained by decoction in water, and particularly of beef, veniſon, mutton, and the nutritive juices of ſeveral young animals, obtained in the ſame manner.

In the beginning of the fever, and while the ſenſes are capable of ſenſation and perception, the influence of many of the ſtimuli of the mind* may have the moſt ſalutary effects; particularly, Hope, and confidence in recovery; agreeable objects alſo preſented to the external ſenſes, and pleaſant ideas excited by every uſual means, will tend, in no ſmall degree, to contribute to this part of the cure of *Typhus*.

Though I have endeavoured to ſhew, that only the particular claſſes of ſtimulants which I have mentioned, viz. 1ſt and 4th,

* See "A Diſſertation on the Influence of the Paſſions upon Diſorders of the Body," by W. FALCONER, M. D.

can be applied with ſucceſs in *Typhus*, and that the *continued* uſe of any of the ſtimulants of the other claſſes, cannot be defended as a ſafe practice; at the ſame time, it muſt be allowed, that an *occaſional* uſe of them to preſerve the living principle, until more healthy ſtimulants can be employed, may be attended with the higheſt advantage, when the irritability is ſo much exhauſted, and ſuch extreme debility has taken place, that only the moſt powerful ſtimulants can have any effect; of theſe I am inclined to give the preference to the ſtimulus of *cantharides*, applied in the form of plaiſters, to the external ſurface of different parts of the body; the application of which alone, or ſometimes preceded by the *camphorated mixture* taken internally, and alternately with the *nitrous* ſolution, I have found to ſucceed to my utmoſt wiſhes in caſes of the moſt extreme debility; and I

uſed

uſed this practice to many of the patients in the number I formerly mentioned.

Some *tonics* alſo may prove aſſiſtant to anſwer this indication; ſuch as *Ferrum* in its different preparations, or diſſolved in water, which has been previouſly ſaturated with the *carbonic acid.* As a *tonic*, or perhaps with more propriety, as a chemical ſtimulant, *Vinum Luſitanum*, diluted with water, may be occaſionally uſed with deſirable effects. The uſe of this wine, when ſymptoms of great debility ſhall indicate, or when other ſtimulants are diſagreeable, may alſo be a means of preſerving the living principle, until the action of the more mild and natural ſtimulants can take place, in a ſufficient degree.

When it is conſidered then, what muſt be acknowledged by every candid Practitioner in Phyſic, that the preſent practice of exhibiting indefinite quantities of bark, and of violent ſtimulants, for the cure of *Typhus*,

is

is often unſucceſsful, and not yet explained on any theoretical principles; and that the practice, founded on the theory here pointed out, has been, in all the trials hitherto made, ſucceſsful, even to a degree higher, than the moſt ſanguine Theoriſt could expect; may not the following corollaries be ſafely drawn?

That the preſent common and general method of cure in *Typhus*, is very precarious, and is founded more on *empirical* than *dogmatical* principles.

That the ſucceſs of the method of cure, now recommended, is, at leaſt, equal with, if not greater than, the method commonly followed; and, conſequently, equally preferable, and entitled to cool attention and impartial trial.

FINIS.

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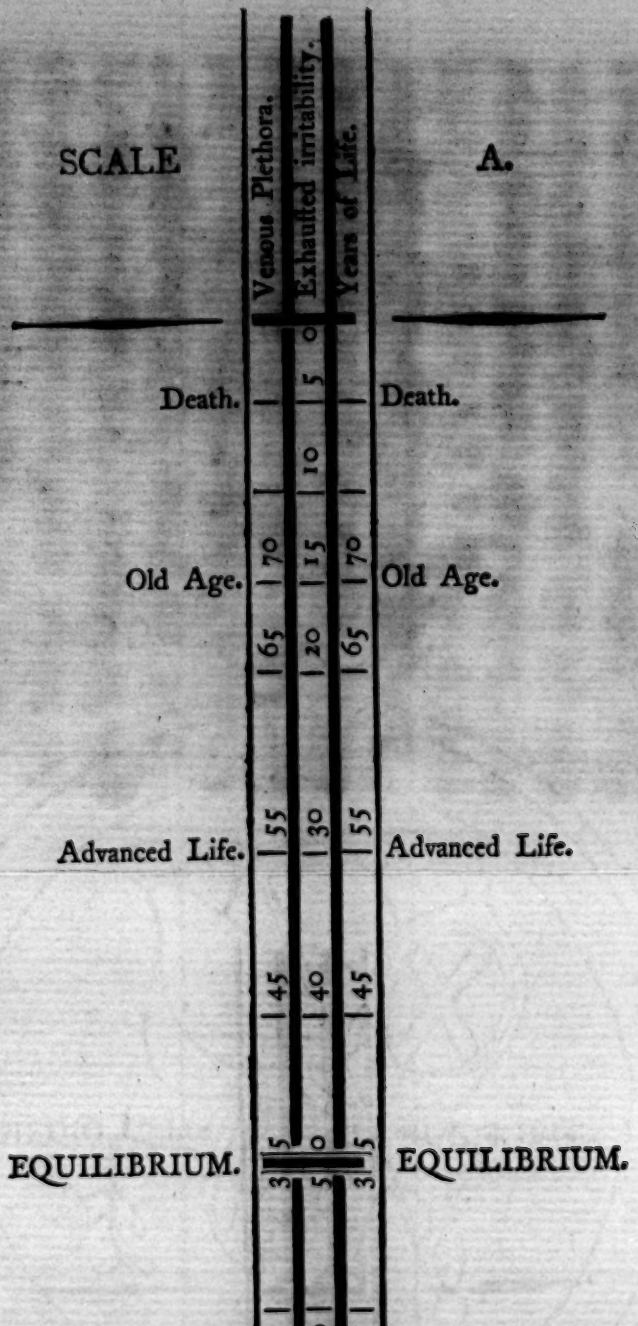
ERRATUM.

Page 1. Preface, *for* Verſaur, *read* Verſchuir.


SCALE
A.
Venous Plethora.
Exhausted irritability.
Years of Life.
Death.
Death.
Old Age.
Old Age.
Advanced Life.
Advanced Life.
EQUILIBRIUM.
EQUILIBRIUM.
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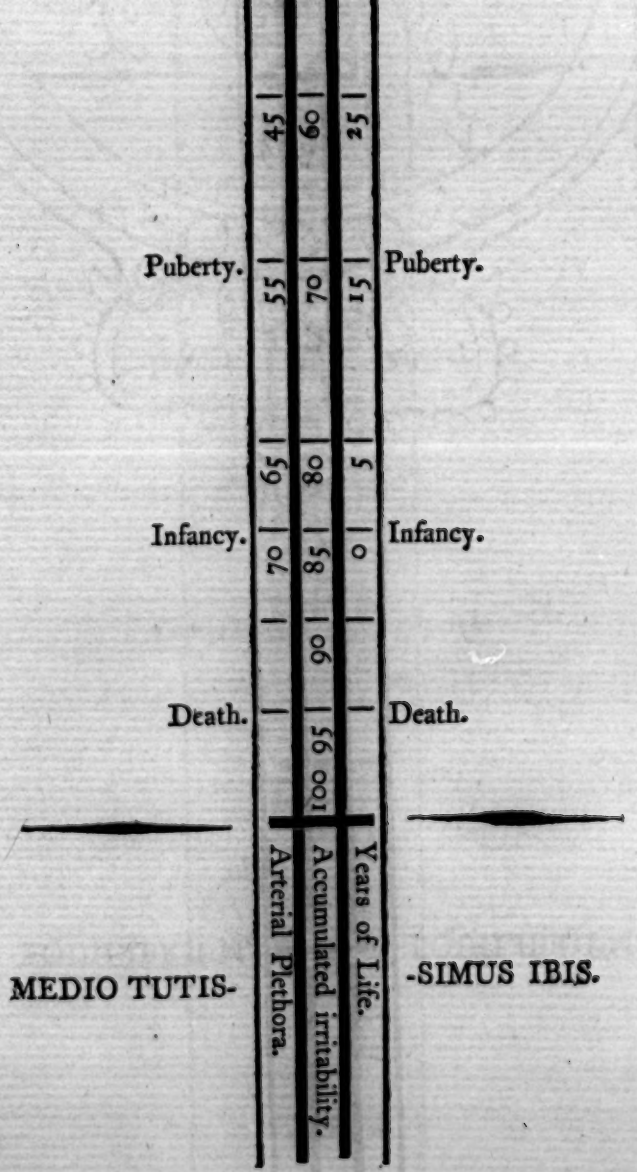
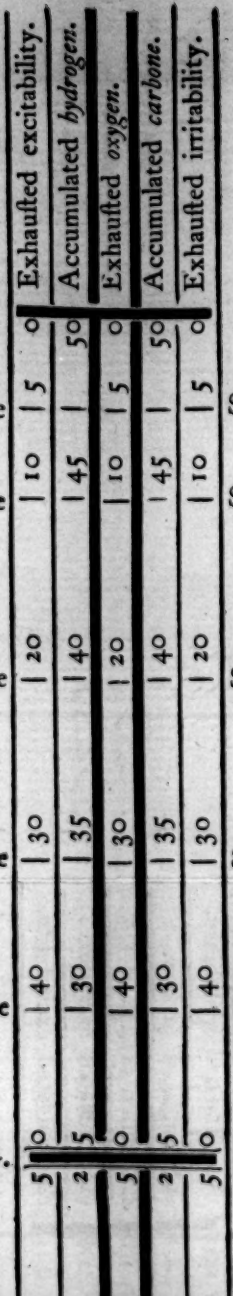


MEDIO TUTIS- -SIMUS IBIS.

SCALE

B.



Death—State

State—Death.

Stupor, Delirium, Inſenſibility. — State

State—Cauſes. Continued action of the contagion of *Peſtis*, *Typhus*, *Variola*, *&c.* of extreme heat, ſtrong liquors, violent paſſions, ſevere exerciſe, large doſe of opium.

1. Watchfulneſs, with Delirium, or,
2. Apoplectic Sleep. — State

State—Cauſes. 1. Action of the contagion of *Peſtis*, *Typhus*, *Variola*, *&c.* large doſe of opium.
2. Extreme heat, ſtrong liquors, violent paſſions, ſevere exerciſe, &c.

Unnatural, or, Forced Sleep. — State

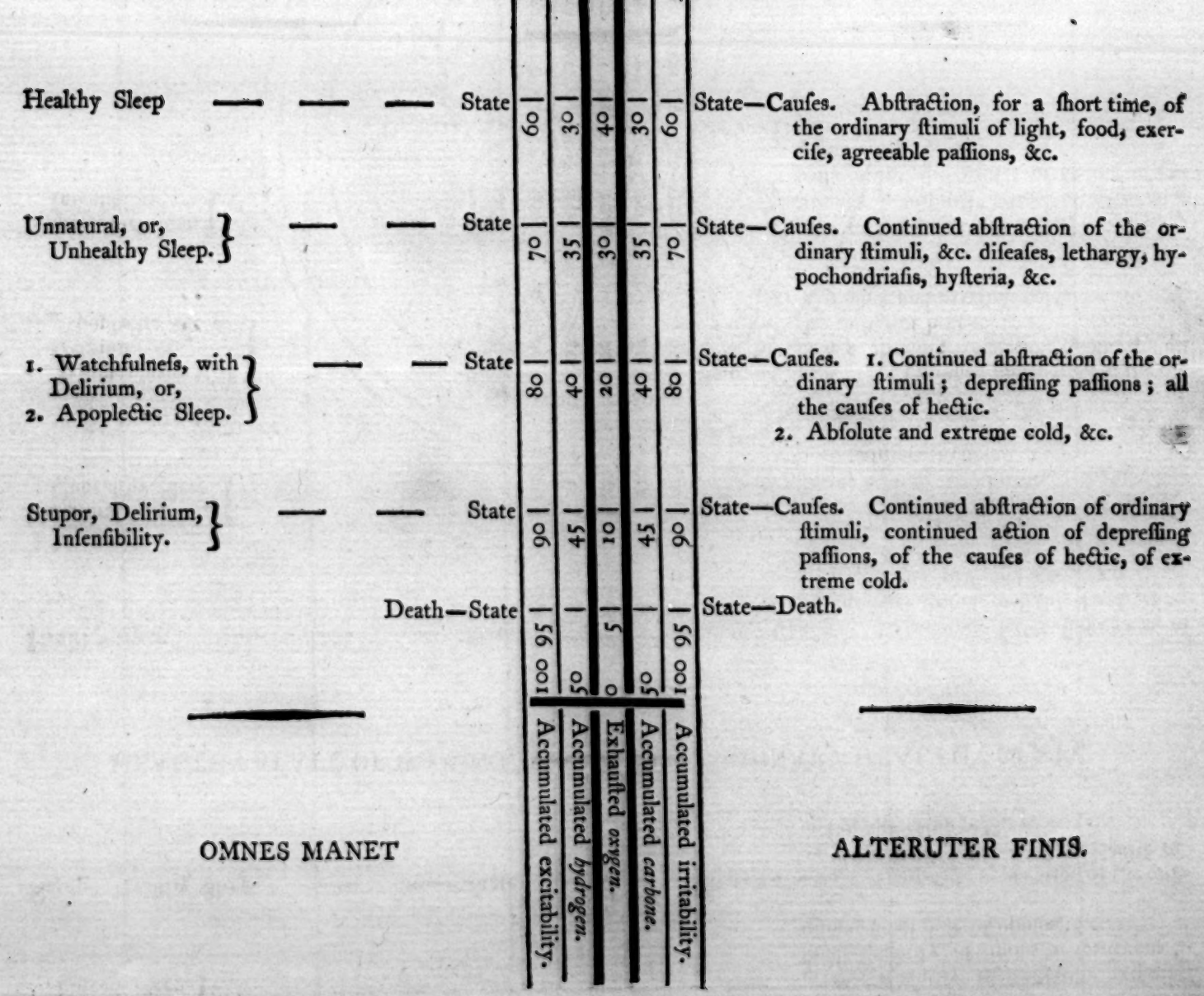
State—Cauſes. Application of ordinary ſtimuli in greater quantity than Nature requires, ſmall quantity of vinous or ſpirituous liquors, ſmall doſe of opium, &c.

Natural Healthy Sleep. — State

State—Cauſes. Temperate application of the ordinary ſtimuli of light, food, moderate exercise, agreeable paſſions, &c.

HEALTHY STATE OF WAKING.

ORDINARY HEALTHY STATE.



OMNES MANET

ALTERUTER FINIS.